SN-specific Science Verification Requirements & Goals

Requirements:
1. First observations of all SN fields. Produce reduced frames with DESDM and check/do the following:
a. Correct masking of bad pixels, glowing edges, & saturated pixels.
b. Visual check that there are no unexpected features (bright stars, dense stellar fields, nearby galaxies). This is a non-quantitative judgment call.
c. Check signal & noise in combined SN images (a single observation consists of multiple exposures per filter which are the co-added to produce a single deep observation)
i. Signal ~N, where N is the number of combined images (tolerance TBD)
ii. Noise ~sqrt(N), where N is the number of images. (tolerance TBD)
Comment: This is especially critical in z-band (11 exposures, total exposure time ~ 1hr).
d. Make template images from first observations (just the mechanics).
Comment: These checks (except a) could be made outside the DESDM framework for reduced images if DESDM is not yet running.

2. Full single epoch processing by DESDM of first observations (see previous item) of all SN fields including
a. Astrometric solution (tolerance on SCAMP chi^2/dof)
b. Photometric solution (tolerance on PSM chi^2/dof)
c. Object catalog including "reasonable" star/galaxy separation (quality TBD)

3. Make SN veto catalog from single epoch star catalog.
Comment: Based on single epoch catalog in DESDM database.

4. Second observation of all SN fields (~1 week after 1st observation).
Prerequisites: SN Templates, SN veto catalog
a. First run of difference imaging (using DESDM).
i. Check threshold detection level
ii. Check chi-squared of frame subtraction (tolerance TBD)
iii. Check that detected objects/candidates is reasonable (TBD)
b. Make improved templates for science data using 2 visits.

5. Demonstrate the ability to select type SNIa at z>0.5 SN using the SNCand table in the DESDM Oracle database and non-DESDM post-processing software.

6. Directly observe BD+17 4708 with DeCAM.
Comment: very short exposures, probably don't need to defocus DeCAM. Should repeat on 2 different nights.
a. Look for repeatability.
b. Look for consistency with SDSS.

7. Demonstrate <24 hr turn-around of SN images. Ideally this would be accomplished at the same time as the 2nd visit to the SN fields.

8. Demonstrate the ability to process SN data without nightly cals (except possibly the pre-twilight flats & bias cals).

9. Make repeat, dithered observations of a SN field that has 3 adjacent fields. About 14 observations per filter ranging from 100 pixel offsets to 10,000 pixels. Something like (100,220,460,1000,2220,4600,10000) for ~100 sec per filter exposures (ugrizY, if available).
Comment: This is for DES camera calibration—not particularly for SN observing. It is thought that we should do this on the SN fields because we will already have deep, repeated observations for 9 sq degrees as a reference.

10. Demonstrate the viability of the DES observing strategy and the ability of OBSTAC to correctly implement the strategy.

11. Demonstrate the ability to send and receive the SISPI manifests that describe the observing blocks of SN data.
Comment: actually using the manifests in DESDM is a "goal". The "requirement" is the 24 hr turn-around, which may or may not require the manifests.

Science Verification Goals

1. Observe the SN fields in u and Y bands. Nominal exposure times would be:
u deep field: 3 exposures of 3 min
Y deep field: 3 exposures of 5 min
u shallow field: 1 exposure of 1 min
Y shallow field: 1 exposure of 1 min
Comment: This is for one visit only and depends on u filter availability. These data are useful for photo-z's, for identification of WD's for calibration and the identification of AGN's & QSO's.

2. Process the SN fields through the standard DESDM coadd stage to produce an object catalog with superior star/galaxy separation.

3. Produce a photo-z catalog of galaxies in the SN fields (using u and Y data, if possible) using single epoch catalogs or (preferably) coadd catalogs from DESDM.

4. Obtain difference imaging thresholds and background rates that are consistent with simulations (exact tolerance TBD).

5. Automate SN difference imaging process using SISPI manifests.